

*Atty Docket: 210453US01 (4081-04401)**Patent***AMENDMENTS TO THE CLAIMS*****Listing of claims:***

1. (Currently Amended) A method of making an olefin oligomerization catalyst comprising a chromium-containing compound; a pyrrole-containing compound; a metal alkyl; a metal halide-containing compound, a non-metal halide-containing compound, or both; and optionally a solvent, the method comprising: abating all or a portion of water, acidic protons, or both from a composition comprising the chromium-containing compound, a composition comprising the pyrrole-containing compound, a composition comprising the non-metal halide-containing compound, a composition comprising the solvent, or combinations thereof by contact thereof with a non-halide metal alkyl prior to contact thereof with a composition comprising the metal halide-containing compound.
2. (Original) The method of claim 1, wherein the composition comprising a metal halide-containing compound comprises (i) a metal alkyl halide, (ii) a metal halide and a metal alkyl, (iii) a non-metal halide and a metal alkyl, or (iv) combinations thereof.
3. (Previously Presented) The method of claim 1, wherein the catalyst comprising abated components yields less of one or more corrosive compounds during olefin oligomerization in comparison to a same catalyst without abated components.
4. (Canceled)
5. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the non-halide metal alkyl comprises triethylaluminum (TEA).
6. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the portion of the non-halide metal alkyl is an amount effective to abate substantially all available water, acidic protons, or both from the compositions contacted with the non-halide metal alkyl.

*Atty Docket: 210453US01 (4081-04401)**Patent*

7. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the acidic protons are provided by 2-ethylhexanoic acid.
8. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the non-halide metal alkyl is added in an amount less than or equal to about 30 weight percent of the total weight of the compositions contacted with the non-halide metal alkyl.
9. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the abating all or a portion of water, acidic protons, or both further comprises forming a mixture by contacting the composition comprising the chromium-containing compound and the non-halide metal alkyl prior to contacting said mixture with the remaining compositions.
10. (Original) The method of claim 9, wherein the non-halide metal alkyl is added to the composition comprising the chromium-containing compound to form the mixture.
11. (Original) The method of claim 9, wherein the non-halide metal alkyl is added in an amount such that the molar ratio of non-halide metal alkyl to chromium-containing compound in the mixture is less than about 1:1.
12. (Original) The method of claim 9, wherein the non-halide metal alkyl is added in an amount sufficient to abate at least about 25 percent of the water, acidic protons, or both.
13. (Original) The method of claim 9, wherein the non-halide metal alkyl is added in an amount that is about a 200 percent excess of an amount sufficient to abate at least about 100 percent of the water, acidic protons, or both.
14. (Original) The method of claim 9, further comprising filtering a precipitate from the mixture prior to combining the mixture with the composition comprising the pyrrole-containing compound, the composition comprising the halide-containing compound, the composition comprising the solvent, any remaining non-halide metal alkyl, or combinations thereof.

*Atty Docket: 210453US01 (4081-04401)**Patent*

15. (Original) The method of claim 9, further comprising contacting the composition comprising the pyrrole-containing compound with the composition comprising the chromium-containing compound prior to said contacting the composition comprising the chromium-containing compound with the non-halide metal alkyl.

16. (Original) The method of claim 15, wherein the non-halide metal alkyl is added to the combination of the composition comprising the chromium-containing compound and the composition comprising the pyrrole-containing compound.

17. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the abating of all or a portion of water, acidic protons, or both further comprises contacting the composition comprising the pyrrole-containing compound with all or a portion of the non-halide metal alkyl to form a mixture prior to contacting the mixture with the remaining compositions.

18. (Original) The method of claim 9, wherein the abating all or a portion of water, acidic protons, or both further comprises combining the composition comprising the pyrrole-containing compound with all or a portion of the non-halide metal alkyl to form a second mixture prior to contacting the second mixture with the remaining compositions.

19. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein the contacting further comprises:

(a) contacting the composition comprising the chromium-containing compound and the composition comprising the pyrrole-containing compound;

(b) contacting the resultant contacted compounds from step (a) and the non-halide metal alkyl; and

(c) contacting the resultant contacted compounds from step (b) and the composition comprising the metal halide-containing compound.

*Atty Docket: 210453US01 (4081-04401)**Patent*

20. (Previously Presented) The method of claim 19, further comprising contacting a non-metal halide with (i) the composition comprising the chromium-containing compound prior to step (a), (ii) the composition comprising the pyrrole-containing compound prior to step (a), (iii) both the composition comprising the chromium-containing compound and the composition comprising the pyrrole-containing compound prior to step (a); or (iv) the resultant contacted compounds from step (a).

21. (Currently Amended) The method of ~~claim 4~~ claim 1, wherein:

(a) the composition comprising the chromium-containing compound and a portion of the non-halide metal alkyl are contacted to form a first mixture;

(b) the composition comprising the pyrrole-containing compound and a portion of the non-halide metal alkyl are contacted to form a second mixture; and

(c) the first mixture and the second mixture are contacted with the composition comprising the metal halide-containing compound.

22. (Original) The method of claim 21, wherein step (c) is performed over a period of time, a starting pyrrole:Cr molar ratio at the start of the period of time is greater than the final pyrrole:Cr molar ratio of the catalyst, and an ending pyrrole:Cr molar ratio at the end of the period of time is less than the final pyrrole:Cr molar ratio of the catalyst.

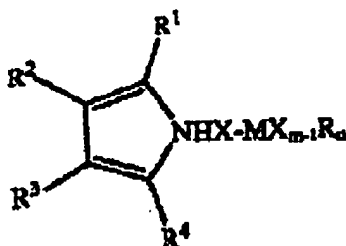
23. (Currently Amended) A process for preparing a chromium-based catalyst, comprising bringing a pyrrole ring-containing compound, an alkyl aluminum compound, and a halogen-containing compound into contact with each other in a hydrocarbon solvent, halogenated hydrocarbon solvent or mixture thereof, and then bringing the mixed resultant solution into contact with the chromium compound, wherein water, acidic protons, or both are abated from the catalyst

*Atty Docket: 210453US01 (4081-04401)**Patent*

or a component thereof by contact thereof with a non-halide metal alkyl prior to or during preparation of the catalyst.

24. (Currently Amended) A process for preparing a chromium-based catalyst, comprising bringing a chromium compound, a pyrrole ring-containing compound, an alkyl aluminum compound, and a halogen-containing compound into contact with each other in a hydrocarbon solvent, halogenated hydrocarbon solvent or mixture thereof in the absence of alpha-olefin under such a condition that the concentration of the chromium compound in the resultant mixed solution is about  $1 \times 10^{-7}$  to 1 mol/liter, wherein water, acidic protons, or both are abated from the catalyst or a component thereof by contact thereof with a non-halide metal alkyl prior to or during preparation of the catalyst.

25. (Currently Amended) A process for treating a catalyst component, comprising abating water, acidic protons, or both from a catalyst component comprising a pyrrole derivative represented by the general formula (I):



(I)

wherein R<sup>1</sup> to R<sup>4</sup> are a hydrogen atom or a linear or branched hydrocarbon group having 1 to 20 carbon atoms, in which R<sup>3</sup> and R<sup>4</sup> may integrally form a ring; X is a halogen atom; M is an element selected from the group consisting of those belonging to 3-Group, 4-Group, 6-Group (exclusive of chromium), 13-Group, 14-Group and 15-Group of the Periodic Table; m and n are numbers satisfying the relationships of  $1 \leq m \leq 6$ ,  $0 \leq n \leq 5$  and  $2 \leq m+n \leq 6$  with the proviso that the sum of m and n is identical to the valence of the element M; n represents the number of

*Atty Docket: 210453US01 (4081-04401)**Patent*

R groups; and R is a hydrogen atom or a linear or branched hydrocarbon group having 1 to 20 carbon atoms when n is not less than 2, and the R groups ~~may be~~ are the same or different, wherein the abating is performed by contact thereof with a non-halide metal alkyl.

26-30. (Canceled)

31. (Currently Amended) A catalyst system for the oligomerization of olefins, the catalyst system comprising:

a chromium source;

a metal alkyl; and

a halopyrrole ligand, wherein water, acidic protons, or both are abated from the catalyst system or a component thereof by contact thereof with a non-halide metal alkyl prior to or during formation of the catalyst.

32-36. (Canceled)

37. (Original) The method of claim 1, wherein all or a portion of the water is removed from the chromium-containing compound prior to contact with the metal halide-containing compound.

38. (Original) The method of claim 1, wherein all or a portion of the water is removed from the chromium-containing compound prior to contact with the metal alkyl-containing compound.

39. (Currently Amended) The ~~A~~ method of claim 37 making an olefin oligomerization catalyst comprising a chromium-containing compound; a pyrrole-containing compound; a metal alkyl; a metal halide-containing compound, a non-metal halide-containing compound, or both; and optionally a solvent, the method comprising: abating all or a portion of water, acidic protons, or both from a composition comprising the chromium-

*Atty Docket: 210453US01 (4081-04401)**Patent*

containing compound, a composition comprising the pyrrole-containing compound, a composition comprising the non-metal halide-containing compound, a composition comprising the solvent, or combinations thereof prior to contact thereof with a composition comprising the metal halide-containing compound, wherein all or a portion of the water is removed from the chromium-containing compound prior to contact with the metal halide-containing compound, and wherein the chromium-containing compound is contacted with a solvent to form a solution and the solution is subjected to distillation to remove a water-containing azeotrope from the solution.

40. (Previously Presented) The method of claim 39, wherein the solvent used to form the distilled solution comprises an aromatic compound, a halogenated compound, a paraffin, or combinations thereof.

41. (Original) The method of claim 40, wherein the aromatic compound comprises benzene, toluene, ethylbenzene, mixed xylenes, ortho-xylene, meta-xylene, para-xylene, or combinations thereof.

42. (Currently Amended) The method of claim 39, wherein the amount of water removed is monitored by infrared analysis or other ~~known methods used means~~ to determine water content.

43. (Currently Amended) ~~The A method of claim 2 making an olefin oligomerization catalyst comprising a chromium-containing compound; a pyrrole-containing compound; a metal alkyl; a metal halide-containing compound, a non-metal halide-containing compound, or both; and optionally a solvent, the method comprising: abating all or a portion of water, acidic protons, or both from a composition comprising the chromium-containing compound, a composition comprising the pyrrole-containing compound, a composition comprising the non-metal halide-containing compound, a composition~~

*Atty Docket: 210453US01 (4081-04401)**Patent*

comprising the solvent, or combinations thereof prior to contact thereof with a composition comprising the metal halide-containing compound, wherein the composition comprising a metal halide-containing compound comprises (i) a metal alkyl halide, (ii) a metal halide and a metal alkyl, (iii) a non-metal halide and a metal alkyl, or (iv) combinations thereof, and wherein one or more catalyst components other than (i) a composition comprising a metal alkyl halide, (ii) a composition comprising a metal halide and a metal alkyl, (iii) a composition comprising a non-metal halide and a metal alkyl, or (iv) combinations thereof, are contacted with an adsorbent to remove water.

44. (Currently Amended) The method of ~~claim 1~~ claim 43, wherein the chromium-containing compound, the pyrrole-containing compound, the non-metal halide-containing compound, the solvent, or combinations thereof, are contacted with an adsorbent to remove water.

45. (Original) The method of claim 44, wherein the adsorbent comprises a 3-Angstrom molecular sieve, a 5-Angstrom molecular sieve, alumina, silica, or combinations thereof.

46. (Currently Amended) A method of making a catalyst composition for use in oligomerizing an olefin comprising a chromium-containing compound, the method comprising abating all or a portion of water, ~~acid~~ acidic protons, or both from a composition comprising the chromium-containing compound prior to or during formation of the catalyst.

47. (Previously Presented) The method of claim 46, wherein the chromium-containing compound is contacted with a non-halide metal alkyl.

48. (Previously Presented) The method of claim 47, wherein the non-halide metal alkyl is triethylaluminum.



**Atty Docket: 210453US01 (4081-04401)**

**Patent**

49. (Currently Amended) The method of claim 46, wherein the chromium-containing compound is contacted with a solvent to form a solution and the solution is subjected to **azeotropic distillation to remove a water-containing azeotrope from the solution.**

50. (Previously Presented) The method of claim 49, wherein the solvent comprises an aromatic compound, a halogenated compound, a paraffin, or combinations thereof.

51. (Currently Amended) The method of claim 49, wherein the solvent is an aromatic compound comprising benzene, toluene, ethylbenzene, mixed-xylene xylenes, ortho-xylene, meta-xylene, para-xylene, or combinations thereof.

52. (Previously Presented) The method of claim 46, wherein the chromium-containing compound is contacted with an absorbent to remove water.

53. (Previously Presented) The method of claim 52, where the absorbent comprises 3-Angstrom molecular sieves, 5-Angstrom molecular sieves, alumina, silica, or combinations thereof.